sustainability

MDPI

Article

Effects of Socio-Academic Intervention on Student Performance in Vulnerable Groups

Tarquino Sánchez-Almeida [1,2], David Naranjo [2,*], Raquel Gilar-Corbi [3] and Jessica Reina [2]

[1] Department of Electronics, Telecommunications and Information Networks, Escuela Politécnica Nacional, Quito 17-01-2759, Ecuador; tarquino.sanchez@epn.edu.ec
[2] Educational Research Group INEDU-EPN, Escuela Politécnica Nacional, Quito 17-01-2759, Ecuador; jesslore_1@hotmail.com
[3] Department of Developmental Psychology and Didactics, University of Alicante, 03080 Alicante, Spain; raquel.gilar@ua.es
* Correspondence: david.naranjo@epn.edu.ec

Abstract: In Ecuador, affirmative action policies enable students from vulnerable groups to preferentially enter universities. However, these policies are limited to admission and do not include academic or socio-economic support mechanisms that, according to the literature, promote student insertion in the higher education system. In this study, the effects of socio-academic intervention on the academic performance of vulnerable students are presented. For this, 41 students were selected among 164 vulnerable students entering the Escuela Politécnica Nacional in the second term of 2019. The 41 students attended a socio-academic intervention course for one term, while the remaining 123 attended the Escuela Politécnica Nacional levelling course directly. Once both groups of students finished the levelling course, their performance in each of the course subjects was compared. The results showed that the academic performance of the students in the intervention was significantly higher in mathematics and geometry compared to the students who had no intervention. These results show that the socio-academic intervention promotes the real insertion of vulnerable students in the university system.

Keywords: student success; academic performance; socio-academic intervention; inclusive education; vulnerable students

Citation: Sánchez-Almeida, T.; Naranjo, D.; Gilar-Corbi, R.; Reina, J. Effects of Socio-Academic Intervention on Student Performance in Vulnerable Groups. *Sustainability* **2021**, *13*, 7673. https://doi.org/10.3390/su13147673

Academic Editors: Antonio-Manuel Rodríguez-García, María-Natalia Campos-Soto and Juan Carlos de la Cruz-Campos

Received: 3 June 2021
Accepted: 29 June 2021
Published: 9 July 2021

1. Introduction

The concept of educational equity in higher education refers to the equal treatment of students in terms of access, permanence, and success in the educational system; no distinctions of gender, ethnicity, religion, social, economic, or political condition; and recognising education as a human right [1]. However, in reality, young university students from higher socio-economic strata have the highest probability of graduation. Conversely, the highest dropout rates occur in students of low socio-economic status, a trend that continues to grow [2].

In 2009, the Organisation for Economic Co-operation and Development (OECD) stated that the success rates of educational cooperation vary mainly in the function of students' admission test scores or the type of educational establishment where they finished high school. These factors, in turn, are associated with the socio-economic strata of the student. Likewise, the OECD noted that dropout problems could be explained by inequality in the secondary education system, where training is generally deficient in lower-income students. Further, dropouts increase by the limited capacity of the higher education system to correct these shortcomings [3].

Faced with this inequitable scenario, state governments have paid particular attention to creating public policies, including affirmative action policies, in response to this problem in the higher education system (HES). Among affirmative action policies is the quota

policy, which enables reserving some places for a specific population group, either for admission to higher education, the job market, or political representation [4,5]. This concept, contextualised in the field of education, includes academic or financial support programmes to reduce educational inequality gaps for students from vulnerable groups.

In this context, universities face the challenge of incorporating students from vulnerable situations into the HES such that their training is oriented towards developing competencies that allow them, as citizens, to participate critically and transform, promoting their access to higher education institutions (HEIs). To a certain extent, this access is guaranteed by quota policies or programmes; however, it is also necessary that these programmes ensure the appropriate conditions that promote real inclusion. Likewise, affirmative policies require a relatively broad approach, as the phenomena that hinder vulnerable students' university trajectory have multidimensional characteristics and are influenced by academic, family, affective, behavioural, and institutional factors [6].

1.1. Previous Studies

In higher education, affirmative action policies have been developing since the emergence of this concept in the mid-twentieth century. Although they were based on offering preferential places to students from vulnerable sectors, experience showed that it was not sufficient to only guarantee access to students, but to guarantee their effective insertion into the HES. Thus, parallel programmes arise that support the implementation of affirmative action policies through support programmes.

In Chile, in 2012, the Levelling Scholarship (BNA) programme was implemented by the Ministry of Education to level the academic skills of disadvantaged students entering the first year of higher education to increase retention, strengthen achievement compliance, and improve academic performance [7].

The Universidad de Concepción in Chile has promoted a series of initiatives to support students from vulnerable sectors to achieve better academic results. The most prominent program implemented is the Student Development Support Centre (CADE), funded by the Ministry of Education and Culture (MINEDUC) and aimed at offering students comprehensive support, employing a strategy of support and accompaniment to students. This is accomplished through actions aimed at strengthening their socio-academic skills and levelling their knowledge of basic sciences and oral and written communication [8].

In the public state University of Playa Ancha de Ciencias de la Educación de Chile, in the first semester of 2012, a Renewed Plan for Levelling Competencies was developed, in which a diversified structure of academic support opportunities was used. This was based on essential competencies for the training of academically disadvantaged students in the first years of university, such as effective scholarly communication, logical reasoning and mathematical problem-solving, scientific critical thinking, and learning management. In addition, a workshop called "Development of strategic skills for university training" was implemented parallel to the corresponding curriculum. All these initiatives were to promote student interest in persisting in the effort to improve academic performance in their different curricular activities [9].

The University of Santiago de Chile (USACH) is a pioneer in creating inclusion policies, implementing propaedeutic programmes or the 5% discount that is the basis of the supernumerary quotas, which opens access to outstanding students regardless of their socio-economic context. In 2012, the USACH created the Access, Equity, and Permanence Programme (PAIEP) as an articulator of access and permanence policies. It hypothesises that school trajectory is a predictor of promising future performances by university students [10].

In recent years, the program "Más Equidad" has been implemented at the University of Costa Rica [11], focusing on three different projects: deferred admission, life skills, and indigenous tutoring. This has been proposed to increase both the investment in processes of scholarships and democratization in public higher education. These pilot programs are showing successful results by achieving a more substantial representation of different

groups and sectors of the society of the country. However, as with most of the Latin-American experiences, the socio-economic limitations of students, especially of those living in communities with scarce resources and that are distant from urban centers, are critical factors that the higher education system still has to face.

Inclusion in higher education must focus on eradicating discrimination, since this could negatively influence students' satisfaction and performance, as mentioned in the study by Baltà et al. [12], in which foreign-born students felt more discrimination than native-born students, and this rejecting perception correlates with dropout. They also mentioned that a heterogeneous educational environment created more complex social and learning environments. Research shows that diversity among students is crucial for the academic development of minorities and majorities, since it promotes the diversification of opinions, which encourages addressing critical issues in an increasingly diverse society [13].

In short, the policies focused not only on access, but also on student permanence. Their central axis is the first-year student tutorials, which emphasise programmes with tutorials in mathematical thinking and academic writing, and the creation of links between peers and tutors, in which the concept of tutoring has been expanded towards a comprehensive accompaniment [14].

1.2. The Present Study

In Ecuador, since 2014, the Secretaría Nacional de Educación, Ciencia, y Tecnología (SENESCYT) implemented an affirmative action policy to expand higher education access to applicants in situations of economic and social vulnerability [15]. Public HEIs, depending on their autonomy, define the number of places offered in the corresponding academic period, either for entry to the first period or for career levelling. Meanwhile, private HEIs, through the implementation of the quota policy, allocate 10% of the total offer to students from the most disadvantaged socioeconomic sectors (LOES) [16].

SENESCYT determines which students are beneficiaries of affirmative action policies in the admission process to universities. Students fill out a survey with their socio-economic data; from this information, an index of relative vulnerability out of 1000 points is determined—the smaller the index, the greater the socio-economic vulnerability.

Subsequently, SENESCYT analyses the distribution of the vulnerability indices of the students of a specific admission period. The students located in the lowest decile are the beneficiaries of the affirmative action policies [15].

In general, the admission process in Ecuador depends on the available places in each HEI and the demand that exists for a particular career. Applicants who obtain the highest application grade scores in the Examination for Access to Higher Education are more likely to access a place in the education system. However, under affirmative action policies, students from underprivileged sectors are awarded additional points for vulnerable situations. Thus, the system encourages access for this group [15].

As of 2017, SENESCYT included new students to the Escuela Politécnica Nacional (EPN) belonging to vulnerable groups through the "quota policy", although their application grades were lower than those of the general population [15].

The EPN is an HEI that offers engineering, science, and technical degrees. Students who obtain a place in the EPN must attend a levelling course during the first academic semester in which they receive classes in mathematics, chemistry, geometry, physics, and language and communication. This course is characterised by requiring a high degree of preparation for students to pass [15].

Each semester, reports sent by the EPN's Information Management Department (DGIP) show that quota policy students' passing percentages are significantly lower than that of the general population [15]. Thus, when comparing the passing rates for the first academic period of 2017, the quota policy students achieved a passing rate of 4.08%, compared to 16.47% for the general-population students. In the second academic period of 2017, the passing percentages were 3.57% and 15.62% for quota policy and general-population students, respectively.

The academic backgrounds closely linked to the socio-economic factors that characterise students from vulnerable groups represent a problem that negatively affects their permanence at university. Among the institutional strategies to reduce desertion and strengthen permanence, a constant evaluation of the dynamics between the university and student behaviour across four factors is required: institutional, academic, personal, and economical. Subsequently, an analysis is conducted of the strengths and weaknesses of each aspect to develop action plans or projects and promote solutions [17].

Therefore, one of the first EPN initiatives to face this problem was to implement an academic-support programme for students from vulnerable groups, which was developed in parallel with the regular classes of the levelling course. This programme included the same subjects as the levelling course. Although the students who participated in this programme improved their academic performance, this improvement was insufficient to pass the levelling course [18].

Consequently, to effectively operationalise the affirmative action policies, the EPN developed a research project in which a pilot socio-academic intervention course was implemented for students from vulnerable groups. This multidisciplinary course or programme was structured around four fields of action: academic, motivational, psychosocial support, and cultural. Thus, in addition to levelling skills in the academic field, the programme sought to provide comprehensive support to students so that they could develop in their different dimensions, improve their self-esteem and self-image, and motivate them during their insertion process in the EPN [19].

Based on the above, this study aims to determine the effects of socio-academic intervention in students from vulnerable groups who entered the EPN in the second term of 2019.

2. Materials and Methods

2.1. Participants

A total of 164 students benefiting from the affirmative action policy entered the EPN in the second term of 2019, 68% of which were male and 32% of which were female. A total of 90% applied to the Engineering, Sciences, and Administrative Sciences levelling course, and 10% applied to the Technical Degrees levelling course. Among the students, 59% came from the province of Pichincha, 22% from other provinces of the Andes Region, 12.1% from provinces of the Amazon Region, and 6.9% from provinces of the Coastal Region.

All students were given a diagnostic test that evaluated their mathematics and geometry skills, with an average score of 4.17 ± 1.5948 out of 10 possible points. For language and communication, the average score was 4.65 ± 1.3844.

We built four clusters of 41 students each. The sample proportions of gender, levelling course type, and the province of origin remained similar to the respective population proportions in these clusters. We proceeded analogously with the diagnostic marks in the sections of mathematics and geometry, and language and communication. The selection of the pilot socio-academic intervention course participants was preceded by an induction session, during which we informed the students about the possibility of participating in the programme during a term before the EPN levelling course. Finally, we randomly selected one of the clusters for intervention in the pilot socio-academic course. The students from the three remaining clusters went directly to the EPN levelling course. Table 1 shows the characteristics of the clusters.

Table 1. Characteristics of the study participants.

Cluster	Gender	Levelling Course Type	Province	Score in Mathematics–Geometry Diagnostic Exam	Score in Language and Communication Diagnostic Exam
Intervention students (PC)	68.3% male 31.7% female	90.2% Engineering, Sciences, and Administrative Sciences 9.8% Technical Degrees	58.5% Pichincha 21.9% Andes 12.2% Amazon 7.4% Coastal	4.16 ± 1.6574	4.68 ± 1.2546
Cluster 1 (C1)	68.3% male 31.7% female	90.2% Engineering, Sciences, and Administrative Sciences 9.8% Technical Degrees	58.5% Pichincha 21.9% Andes 12.2% Amazon 7.4% Coastal	4.17 ± 1.6690	4.74 ± 1.4541
Cluster 2 (C2)	68.3% male 31.7% female	90.2% Engineering, Sciences, and Administrative Sciences 9.8% Technical Degrees	58.5% Pichincha 21.9% Andes 12.2% Amazon 7.4% Coastal	4.19 ± 1.7824	4.55 ± 1.4211
Cluster 3 (C3)	68.3% male 31.7% female	90.2% Engineering, Sciences, and Administrative Sciences 9.8% Technical Degrees	58.5% Pichincha 21.9% Andes 12.2% Amazon 7.4% Coastal	4.16 ± 1.2859	4.63 ± 1.4428

2.2. Measurements

We collected the final score out of 40 points obtained by the students of the four clusters in each of the EPN levelling course subjects: mathematics, geometry, physics, chemistry, and language and communication. This score shows the results of work during the term by students, who were required to submit assignments and take tests and exams.

Further, we identified the students who dropped out of the EPN levelling course, corresponding to those cases in which they did not have grades in any of the five subjects.

Finally, we identified those students who passed and those who failed the EPN levelling course based on their final score out of 40 points, following the provisions of the EPN's Regulations for the Academic Regime.

2.3. Procedure

Before implementing the pilot socio-academic intervention course, we undertook a diagnostic stage wherein we identified the primary academic deficiencies with which students entered the EPN levelling course. For this, the Basic Science Department teachers designed a diagnostic questionnaire employing the Delphi technique. We pretested the questionnaire with 29 students from vulnerable groups and 34 students from the general population who entered the levelling course for the first time in the second term of 2018.

Based on the pretest results, we performed the validation of the questionnaire through the determination of the reliability. Subsequently, we piloted the updated questionnaire with 279 students from vulnerable groups and 995 from the general population, who entered the levelling course for the first time in the first term of 2019.

We verified the validity and reliability of the questionnaire based on the pilot results. We decided that it would be the standard questionnaire to measure the students' academic abilities and consequently design the curricular program of the pilot socio-academic intervention course.

The final questionnaire was structured in two sections: the first concerning mathematics, and the second concerning language and communication. It consisted of 80 questions to be answered in 60 min, distributed in 55 and 25 for each of the sections, respectively.

Students from the selected intervention cluster attended the pilot socio-academic intervention course for one term. The remaining students from the three clusters continued into the levelling course.

In the pilot socio-academic intervention course, students received classes in mathematics, geometry, and reading and writing for 10 h per week each. They also received training in the use of computer tools, study techniques and strategies, and motivation and coaching workshops for two hours a week for each. In these workshops, the students explored different aspects concerning the development of soft skills and emotional intelligence, and how they could apply these skills in their teaching–learning process.

For mathematics and geometry classes, the students worked simultaneously with an artificial intelligence system for evaluation and autonomous learning, ALEKS®. Parallel to the training process, they received continuous monitoring through the social work area created exclusively to work with these students.

Once the students of the intervention cluster completed the intervention course, they continued their studies in the EPN levelling course in the subsequent term.

In the EPN levelling course, students received classes in mathematics, geometry, physics, chemistry, and language. This course aimed to level the knowledge and skills of high school graduates so that they could successfully continue their professional training in the different careers offered by the EPN.

The information used in this study was obtained from the databases of the DGIP-EPN. All the students considered in this study agreed to participate voluntarily through informed consent. Only totalised and anonymous information is presented.

2.4. Data Analysis

To evaluate the effects of the intervention course on academic performance, we conducted a one-way analysis of variance (ANOVA) of the final score in each one of the subjects of the EPN. In addition, we conducted a post hoc Tukey test to identify homogeneous groups.

Concurrently, we carried out two chi-squared tests of independence. The first test was conducted between the type of cluster and the variable representing whether a student dropped out of the EPN levelling course. The second test was conducted between the type of cluster and the variable representing whether a student passed the levelling course.

All analyses were performed at a significance level of 5% and were conducted using SPSS version 22.

3. Results

Figures 1–5 show the box plots of the final score in each of the subjects of the EPN levelling course of both the students who attended the intervention course and those who did not.

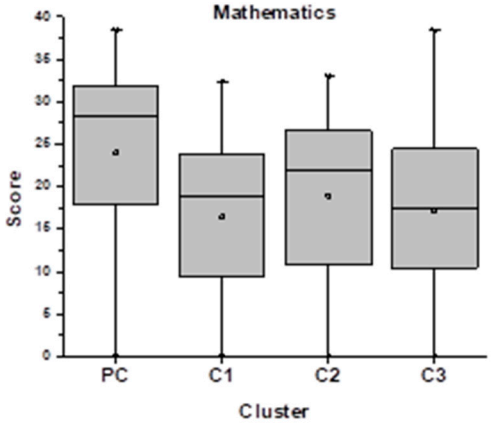

Figure 1. Box plot of the final mathematics score of the students who attended the pilot course for socio-academic intervention and the control clusters.

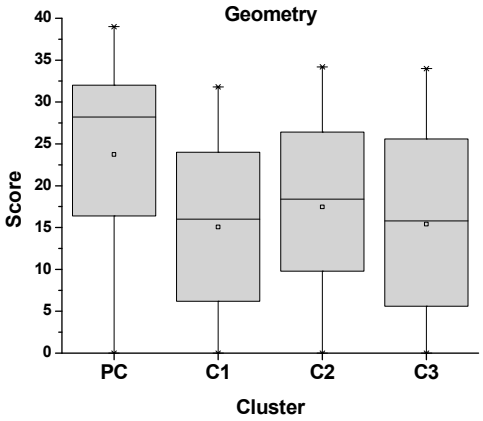

Figure 2. Box plot of the final score in geometry for the students who attended the pilot course for socio-academic intervention and the control clusters.

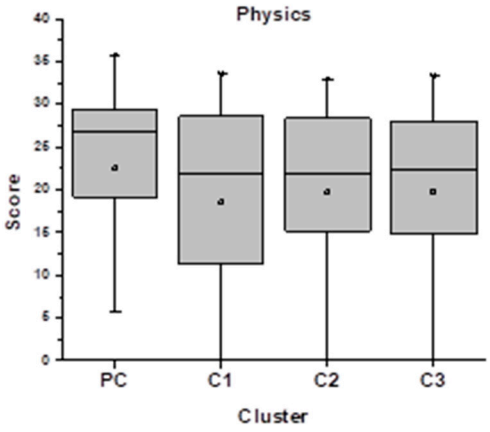

Figure 3. Box plot of the final score in physics for the students who attended the pilot course for socio-academic intervention and the control clusters.

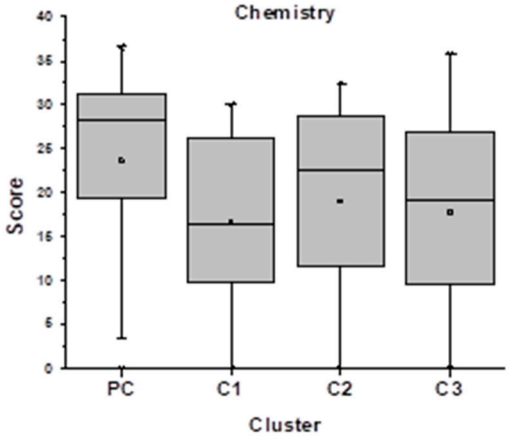

Figure 4. Box plot of the final score in chemistry for the students who attended the pilot course for socio-academic intervention and the control clusters.

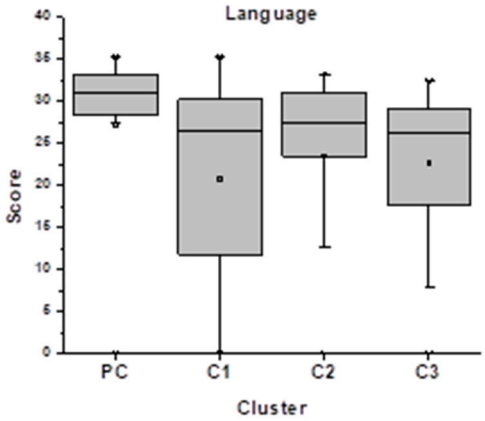

Figure 5. Box plot of the final score in language for the students who attended the pilot course for socio-academic intervention and the control clusters.

Table 2 shows the results of the one-way ANOVA. At a significance level of 5%, there were no significant differences between the physics final score among the four clusters. To determine between which clusters there were significant differences on the four remaining subjects, we conducted a post hoc Tukey test, the results of which are presented in Table 3.

Table 2. Results of the one-way ANOVA of the final score in each of the subjects of the EPN levelling course.

		Sum of Squares	df	Mean Square	F	Sig.
Mathematics	Between groups	1140.020	3	380.007	7.226	0.000
	Within groups	7099.536	135	52.589		
	Total	8239.556	138			
Geometry	Between groups	1433.739	3	477.913	6.946	0.000
	Within groups	9288.510	135	68.804		
	Total	10,722.249	138			
Physics	Between groups	107.163	3	35.721	.704	0.551
	Within groups	6849.110	135	50.734		
	Total	6956.273	138			
Chemistry	Between groups	665.781	3	221.927	3.395	0.020
	Within groups	8824.034	135	65.363		
	Total	9489.815	138			
Language	Between groups	412.794	3	137.598	3.853	0.011
	Within groups	4821.564	135	35.715		
	Total	5234.359	138			

Table 3. Results of the post hoc Tukey test of the final score in each of the subjects of the EPN levelling course.

Group	Mathematics Subset		Geometry Subset		Physics Subset	Chemistry Subset		Language Subset	
	1	2	1	2	1	1	2	1	2
PC	26.5568		26.2919		24.8486	26.1135		30.0595	
C1		20.2061		18.6727	22.8000		20.6606		25.8606
C2		20.7486		20.4629	22.8588	22.3086	22.3086	27.3943	27.3943
C3		19.4941		18.5118	22.9314		21.0471		25.9353
Sig.	1.0000	0.8890	1.0000	0.7610	0.6290	0.2080	0.8310	0.2520	0.7090

These results showed that the average final score of the students who attended the intervention course was significantly higher in mathematics and geometry than that of the three control clusters. The students in the three control clusters, in turn, presented a behaviour similar to each other in these subjects.

Although the average physics score of the students who attended the intervention course was higher than that of the three control clusters, the difference was not statistically significant.

Concerning chemistry and language, the average score of the students who attended the intervention course was similar to that of cluster 2. Nevertheless, it was significantly higher than that obtained by the students in clusters 1 and 3. However, when observing the final score distribution for language, we noticed that the students who attended the intervention course obtained a higher score than those from the control clusters. Further, the distribution deviation was comparably minor.

Figure 6 shows the results of the chi-squared test of independence between clusters and dropouts. At a significance level of 5%, dropout was independent of the cluster, implying that dropouts were neither higher nor lower among students who participated in the pilot intervention course and those who did not.

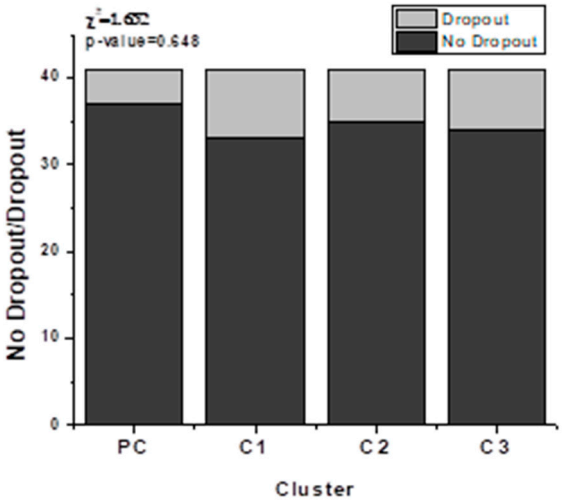

Figure 6. Students who dropped out of the EPN levelling course.

Figure 7 shows the results of the chi-squared independence test of passing the EPN levelling course among the clusters. At a significance level of 5%, passing was not independent of the cluster. Thus, from the students who attended the pilot intervention course, 46.3% passed the EPN levelling course, whereas in the remaining clusters, the average passing rate was 12.2%.

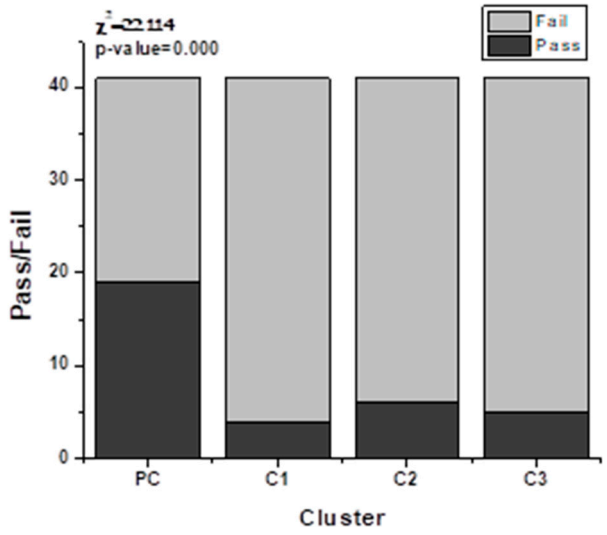

Figure 7. Students who passed the EPN levelling course.

4. Discussion

In Latin America and the Caribbean, concerns about failure and dropout from higher education are no less than in the rest of the world. According to a World Bank report, [19] although the number of higher education students increased dramatically to 20 million in the last decade, only half managed to graduate.

The causes of failure, repetition, and abandonment in university students are diverse. A broad approach to the main causes identifies the following [20–23]: (a) lack of guidance and prior training of students; (b) inadequate study plan design; (c) poor monitoring of students, especially those who experience failure from the beginning; (d) low quality of teaching; (e) low academic performance of students due to lack of ability, study techniques, effort, or motivation; (f) an inadequate level of demand on the part of the teaching staff; (g) the need to reconcile domestic or paid work outside the university with studies; and (h) a lack of social integration in the university environment. Prevention and retention programmes should be based on improving these aspects to reduce failure and abandonment of studies on the part of the students.

This research presents the results of an intervention programme, with the aim of preventing academic failure and dropout, by improving the social, personal, and academic competencies of new students from disadvantaged groups. In this way, the proposed intervention tries to incorporate all the aspects that current research has identified as key to preventing failure and dropout.

Like any intervention programme that claims to be effective, it is a programme that is well grounded in theory and well planned and developed. The program has been designed based on the analysis of the causes of academic success and failure in higher education, together with the knowledge of the results of programmes to improve personal and academic competencies, aimed at preventing failure and dropout, especially in disadvantaged groups that are incorporated into higher studies, taking into account the characteristics of education in science, technology, engineering, and mathematics.

The failure and abandonment of university studies is an issue that worries all nations, due to the personal, social, and economic cost that this entails.

At the European level, the importance that most countries attach to this issue is evident, as reflected in the report of the HEDOCE project (Higher Education Drop-Out and Completion in Europe) published by the European Commission [24], and that includes a compilation of national policies designed to address this problem.

Some studies carried out at the European level focus on the failure and abandonment of sociocultural disadvantaged students and those belonging to ethnic minorities [25], the results of which showed that coming from a poor socio-economic background was the dominant factor that led to minority student dropout, as well as a lack of attention to the needs of a more diverse student population and a student-centered approach in designing and developing better educational programs for these students.

There are also educational research projects funded by the European Union, such as the MasSDiV [26], the main objective of which is to implement effective measures based on research evidence in Europe, in response to social needs derived from the increase in diversity in classrooms and the need to guarantee scientific and mathematical literacy for all, including minorities and disadvantaged groups.

The approach to this issue in the United States is characterized not only by the analysis of the causes of academic failure, repetition, and/or dropping out of studies, but also by the implementation and evaluation of intervention programs aimed at improving and reversing this phenomenon [27].

At the moment, Europe faces a shortage of people with scientific knowledge at all levels of society. To this end, in the Horizon Program 2020, the European Commission dedicated more than 13 million euros to subsidize initiatives dedicated to increasing the attractiveness of science education and scientific careers and promoting the interests of young people in STEM [28].

Most of the systematic actions to prevent academic failure and university dropouts have been developed in Anglo-Saxon countries [29,30], despite the need to implement and evaluate programmes of this type in Europe [24] and Latin America [31].

Rigorous evaluation of the effectiveness of programmes to prevent college failure and dropout shows positive results. As early as the 1980s, the meta-analysis results of Kulik et al. [32] revealed a moderate and significant effect of these programmes on the academic results of disadvantaged students and those at risk of failure. Meanwhile, since the 1990s, the North American educational administration has collected and systematised the results of intervention programmes with disadvantaged students in higher education [33] and promoted the implementation of new programmes [34,35].

More recently, in this same Anglo-Saxon setting, there has been considerable research on intervention programmes with students at risk of academic failure and dropout. Andrews, Clark, and Thomas [29] provided a compendium of effective practices for retaining students in higher education in the UK. Robbins et al. [36] highlighted the importance of motivational and emotional aspects in these intervention programmes. Further, Thomas [37] collected the most effective aspects within these intervention programmes for retention and academic success. The new intervention programmes designed to improve affective and cognitive aspects, which are intended to prevent failure and abandonment, must be based on previous results of these types of programmes and consider the results of research on the personal and educational factors that influence the success of university students in general [38,39].

The intervention that has been tested in this research incorporates all the key aspects fundamental to the improvement of students' personal and academic capacities. It shows its effectiveness in promoting the inclusion of students from disadvantaged and minority groups in higher education in the specific fields of science, technology, engineering, and mathematics.

The following, collected in four blocks, describes the most important factors that, based on the results of existing research, have been included in this intervention with students:

(1) Factors related to the student: development of academic and performance self-efficacy [40]; encourage/strengthen resilience [25]; development of emotional and motivational control [36]; development of self-regulated learning strategies, motivation, self-efficacy, achievement motivation, and motivation towards learning [39]; and anxiety reduction [41].
(2) Factors related to social and family characteristics: financial aid through the provision of materials and spaces for work and study on academic tasks [24]; improvement of social relations with colleagues, teachers, and social environment [20]; social support [20,24]; and help in organizing study time [20,25].
(3) Factors related to the teaching staff and the class climate: the behavior of the teaching staff is important to promote and maintain students' self-efficacy; establishing tasks graded in difficulty; providing feedback on successful execution; and reducing student anxiety and stress about the course, exams, and presentations, promoting mastery experiences and consequently increasing self-efficacy [42]; extra-curricular training for the development of general skills such as general academic skills, learning strategies, and motivation [36].
(4) Factors related to the institution of higher education: creation of a culture of commitment among students, teachers, and managers (meetings, welcoming, talks by teachers or students of higher courses, support units for beginning students, etc.) [20,24]; and monitoring of the study progress of individual students and adaptation of study schedules and times [24,25].

Regarding the results for the highest average final grade obtained in mathematics and geometry in the EPN levelling course, they indicated better academic performance in these subjects compared to the groups that were not part of the project. This demonstrated that the teaching process of these subjects was adequate and of quality within the pilot intervention course. The subjects of physics and chemistry were not included in the

academic programme of the pilot intervention course; hence, students in the intervention group obtained a slight improvement in their performance. Regarding the control groups, it was assumed that in both cases, the students had practically the same cognitive biases on these subjects obtained during their training in high school.

On the subject of language and communication, the students' project evaluation results indicated a high level of academic performance with little dispersion in comparison with the control groups. Thus, we could deduce that the intervention group had better cognitive training on the topic at the time of entering the EPN levelling course.

We could affirm that the teaching procedures applied in the subject of language and communication were essential and adequate to develop the students' abilities and skills for application in other subjects.

The pilot intervention course contributed to improving the academic performance and level of approval of the affirmative action students who participated in it, as shown in Figure 7. This was justified by the efficiency of the academic programme taught during the intervention process. However, due to the vulnerability characteristics that defined both the pilot and control intervention groups, we established that despite the social, economic, emotional/affective, technological, and health conditions, among others, they presented similar levels regarding student dropout rates in the levelling course. This was possibly due to the lack of preparation and experience in a virtual education system caused by the COVID-19 emergency, which has affected all areas worldwide.

This research provides solutions and proposals that could be applied in other educational institutions facing the same problems. It seeks to assist in the implementation of actions aimed at preventing failure and abandonment in disadvantaged students to achieve the inclusion of these students in higher education.

Author Contributions: Conceptualisation, T.S.-A. and D.N.; methodology, D.N.; software, D.N.; validation, D.N.; formal analysis, D.N.; investigation, J.R.; resources, T.S.-A.; data curation, D.N.; writing—original draft preparation, D.N., J.R. and R.G.-C.; writing—review and editing, D.N., J.R. and R.G.-C.; project administration, T.S.-A.; funding acquisition, T.S.-A. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the Secretaría Nacional de Educación Superior, Ciencia, Tecnología e Innovación (SENESCYT; PIC-18-INE-EPN-002).

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of University of Alicante (UA-2021-04-20, 30 April 2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data sets generated and analysed during this study are available from the corresponding author upon reasonable request.

Acknowledgments: The authors thank the Escuela Politécnica Nacional and the Universidad de Alicante. This study was approved by the ethics committee of the Universidad de Alicante in the scope of the doctoral project "Validación de la Escala de Valoración de la Docencia de la Escuela Politécnica Nacional de Ecuador, un Análisis de su Relación con el Rendimiento Académico".

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Martha Leticia Quintanilla Acosta Tegucigalpa, La Equidad En Los Estudiantes de Grupos Vulnerables de la Universidad Nacional Autónoma de Honduras en el Período 2010–2016. Ph.D. Dissertation, Faculty of Education Sciences, UNED, Tegucigalpa, Honduras, 2018. Available online: https://repositorio.uned.ac.cr/reuned/bitstream/handle/120809/1820/TESISFINAL2019-MARTHAQUINTANILLA-UNED-CR_14.06.2019.pdf?sequence=1&isAllowed=y (accessed on 28 May 2021).
2. Canales, A.; de los Ríos, D. Retención de estudiantes vulnerables en la educación universitaria. *Calid. Educ.* **2009**, *30*, 50. [CrossRef]
3. Domingues, P. Ações afirmativas para negros no Brasil: O início de uma reparação histórica. *Rev. Bras. Educ.* **2005**, *29*, 164–176. [CrossRef]

4. Claudio, J.A.C.; Herrera, R.A.R. *Análisis de los Determinantes Sociodemográficos del Acceso General a la Educación Superior en el Ecuador e Indentificación de la Política de Cuotas Para los Grupos Vulnerables Durante el año 2014*; Escuela Politécnica Nacional: Quito, Ecuador, 2019.
5. Sallan, J.G.; Suárez, C.I. *Inclusión y Grupos en Situación de Vulnerabilidad: Orientaciones para Repensar el rol de las Universidades*; Sinectica: Guadalajara, Mexico, 2016.
6. Fortalecimiento Institucional. Available online: http://dfi.mineduc.cl/ (accessed on 3 May 2021).
7. Hernández, V.S.; Larenas, C.D.; Salgado, M.T.C. Beca de Nivelación Académica: Resultados de un Programa de Intervención en Estudiantes de Origen Vulnerable en la Universidad de Concepción. *Educ. Rev.* **2017**, *33*. [CrossRef]
8. Dapelo, B.; Marcone, R. Efectividad de Una Experiencia de Nivelación Académica en Educación Superiorin. In Proceedings of the 10th Jornadas Internacionales de Innovación Universitaria, Madrid, Spain, 11–12 July 2013; Available online: http://hdl.handle.net/11268/2685 (accessed on 28 May 2021).
9. Pavez, B.R.; Molina, R.M.; Llambias, F.J.G. Programa de Acceso Inclusivo Equidad y Permanencia de la Universidad de Santiago de Chile: Una Política Universitaria de Acción Afirmativa. In Proceedings of the Tercera Conferencia Latinoamericana sobre el Abandonono en la Educación Superior, Mexico City, Mexico, 13–15 November 2013; Available online: https://revistas.utp.ac.pa/index.php/clabes/article/view/953 (accessed on 29 May 2021).
10. Vásquez, A. *Impacto en el Rendimiento Académico de Estudiantes con Beca de Nivelación Académica Participantes en el Programa de Tutorías de la Universidad de Santiago de Chile*; Pre-Alas: Santiago de Chile, Chile, 2014. Available online: https://www.academia.edu/15178681/Impacto_en_el_rendimiento_acad%C3%A9mico_de_estudiantes_con_Beca_de_Nivelaci%C3%B3n_Acad%C3%A9mica_participantes_en_el_programa_de_tutor%C3%ADas_de_la_Universidad_de_Santiago_de_Chile (accessed on 10 May 2021).
11. Hidalgo, A.M.M. Innovaciones en modelos de admisión Estudio de casos y estrategias de inclusión en educación superior. *Actual. Investig. Educ.* **2017**, *17*. [CrossRef]
12. Balta, R.; Olmedo-Torre, N.; Pena, M. Do students from underrepresented groups feel integrated into engineering degrees? In Proceedings of the Frontiers in Education Conference FIE, Uppsala, Sweden, 21–24 October 2020; Volume 2020. [CrossRef]
13. Pike, G.R.; Kuh, G.D. Relationships among structural diversity, informal peer interactions and perceptions of the campus environment. *Rev. High. Educ.* **2006**, *29*, 425–450. [CrossRef]
14. Sandoval, I.; Sánchez, T.; Velasteguí, V.; Naranjo, D. Factores Asociados al Abandono en Estudiantes de Grupos Vulnerables. Caso Escuela Politécnica Nacional. Congr. CLABES. 2018, pp. 132–141. Available online: https://revistas.utp.ac.pa/index.php/clabes/article/view/1907 (accessed on 28 May 2021).
15. SNAA. *Acuerdo No. SENESCYT-2019-030*; SENESCYT: Quito, Ecuador, 2019; p. 26.
16. Sandoval, I.; Sánchez, T.; Naranjo, D.; Jiménez, A. Proposal of a mathematics pilot program for engineering students from vulnerable groups of Escuela politécnica Nacional. In Proceedings of the LACCEI International Multi-Conference Engineering, Education and Technology, Montego Bay, Jamaica, 26–28 July 2019; Volume 2019. [CrossRef]
17. Pérez, C.L.; Parés, N.S.; Ruiz, M.M. Los programas institucionales de acción tutorial: Una experiencia desarrollada en la universidad de alicante. *Rev. Investig. Educ.* **2011**, *29*, 341–361.
18. Espinosa-Castro, J.-F.; Hernández-Lalinde, J.; Castro, L.M. Estrategias de permanencia universitaria. *AVFT Arch. Venez. Farmacol. Ter.* **2020**, *39*. [CrossRef]
19. World Bank. Momento Decisivo. La Educación Superior en América Latina y el Caribe. [Decisive Moment. Higher Education in Latin America and the Caribbean]. 2017. Available online: https://openknowledge.worldbank.org/bitstream/handle/10986/26489/211014ovSP.pdf?sequence=5&isAllowed=y (accessed on 28 May 2021).
20. Bernardo, A.; Esteban, M.; Fernández, E.; Cervero, A.; Tuero, E.; Solano, P. Comparison of Personal, Social and Academic Variables Related to University Drop-out and Persistence. *Front. Psychol.* **2017**, *8*, 1355. [CrossRef] [PubMed]
21. U-Ranking Report. Indicadores Sintéticos de las Universidades Españolas. Synthetic Indicators of Spanish Universities, Fundación BBVA. 2019. Available online: https://www.fbbva.es/wp-content/uploads/2019/04/Informe-U-Ranking-FBBVA-Ivie-2019.pdf (accessed on 25 May 2021).
22. Museus, S.D. The Culturally Engaging Campus Environments (CECE) Model: A New Theory of Success among Racially Diverse College Student Populations. In *Higher Education: Handbook of Theory and Research*; Paulsen, M., Ed.; Springer: Dordrecht, The Netherlands, 2014; Volume 29. [CrossRef]
23. Tuero, E.; Cervero, A.; Esteban, M.; Bernardo, A. Por qué abandonan los alumnos universitarios? Variables de influencia en el planteamiento y consolidación del abandono. [Why do college students drop out? Influence variables in the approach and consolidation of abandonment]. *Educación XX1* **2018**, *21*, 131–154. [CrossRef]
24. European Commission. *Dropout and Completion in Higher Education in Europe*; Publications Office of the European Union: Luxembourg, 2015. Available online: https://op.europa.eu/en/publication-detail/-/publication/4deeefb5-0dcd-11e6-ba9a-01aa75ed71a1 (accessed on 28 May 2021).
25. Quinn, J. *Drop-Out and Completion in Higher Education in Europe among Students from under—Represented Groups*; Publications Office of the European Union: Luxembourg, 2013. Available online: https://nesetweb.eu/wp-content/uploads/2019/06/2013-Drop-out-and-Completion-in-Higher-Education-in-Europe-among-students-from-under-represented-groups.pdf (accessed on 26 June 2021).

26. MasSDiV. Supporting Mathematics and Science Teachers in Addressing Diversity and Promoting Fundamental Values. Proyect Funding by European Union. 2017–2020. Available online: https://www.um.edu.mt/projects/masdiv/ (accessed on 27 June 2021).
27. ACT. STEM Education in the U.S.: Where We Are and What We Can Do. 2017. Available online: https://www.act.org/content/dam/act/unsecured/documents/STEM/2017/STEM-Education-in-the-US-2017.pdf (accessed on 27 June 2021).
28. European Commission. *Horizon 2020 Work Programme, 2014–2015*; Publications Office of the European Union: Luxembourg, 2014. Available online: https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-intro_en.pdf (accessed on 26 June 2021).
29. Andrews, A.; Clark, R.; Thomas, L. Compendium of Effective Practice in Higher Education Retention and Success. Aston University. 2012. Available online: http://www.heacademy.ac.uk/assets/documents/what-works-tudent-retention/What_Works_Compendium_Effective_Practice.pdf (accessed on 27 June 2012).
30. Radloff, A. *Student Engagement at New Zealand Institutes of Technology and Polytechnics: Key Results from the 2010 Pilot*; Australian Council for Educational Research: Melbourne, Australia, 2010. Available online: https://research.acer.edu.au/cgi/viewcontent.cgi?article=1012&context=ausse (accessed on 28 May 2021).
31. Moncada, L.-F. La integración académica de los estudiantes universitarios como factor determinante del abandono de corto plazo. Un análisis en el Sistema de Educación Superior a Distancia del Ecuador. [The Academic Integration of University Students as a Determining Factor of Short-Term Dropout. An Analysis in the Distance Higher Education System of Ecuador. *RIED* **2014**, *17*, 173–196. Available online: http://revistas.uned.es/index.php/ried/article/view/12683 (accessed on 29 May 2021).
32. Kulik, C.-L.; Kulik, J.; Shawald, B. College programs for high-risk and disadvantaged students: A meta-anslysis of findings. *Rev. Educ. Res.* **1983**, *53*, 397–414. [CrossRef]
33. Chancy, B.; Lewis, L.; Farris, E. *Programs at Higher Education Institutions for Disadvantaged Precollege Students*; US Department of Education: Washington, DC, USA, 1995. Available online: https://nces.ed.gov/pubs96/96230.pdf (accessed on 28 May 2021).
34. Chaney, B.; Muraskin, L.D.; Cahalan, M.W.; Goodwin, D. Helping the Progress of Disadvantaged Students in Higher Education: The Federal Student Support Services Program. *Educ. Eval. Policy Anal.* **1998**, *20*, 197–215. [CrossRef]
35. Haskins, R. A New Federal Strategy to Prepare Disadvantaged Students for College. (Thursday, 16 January 2014). Available online: https://www.brookings.edu/testimonies/a-new-federal-strategy-to-prepare-disadvantaged-students-for-college/ (accessed on 29 May 2021).
36. Robbins, S.B.; Oh, I.-S.; Le, H.; Button, C. Intervention effects on college performance and retention as mediated by motivational, emotional, and social control factors: Integrated meta-analytic path analyses. *J. Appl. Psychol.* **2009**, *94*, 1163–1184. [CrossRef] [PubMed]
37. Thomas, L. *Building Student Engagement and Belonging in Higher Education at a Time of Change: A Summary of Findings and Recommendations for the What Works? Student Retention and Success Programme*; Paul Hamlyn Foundation: London, UK, 2012. Available online: https://www.heacademy.ac.uk/system/files/what_works_final_report.pdf (accessed on 28 May 2021).
38. Richardson, M.; Abraham, C.; Bond, R. Psychological correlates of university student's academic performance: A systematic review and meta-analysis. *Psychol. Bull.* **2012**, *138*, 353–387. [CrossRef] [PubMed]
39. Schneider, M.; Preckel, F. Variables associated with achievement in higher education: A systematic review of meta-analysis. *Psychol. Bull.* **2017**, *143*, 565–600. [CrossRef] [PubMed]
40. Ashford, S.; Edmunds, J.; French, D.P. What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? *Br. J. Health Psychol.* **2010**, *15*, 265–288. [CrossRef] [PubMed]
41. Huntley, C.D.; Young, B.; Jha, V.; Fisher, P.L. The efficacy of interventions for test anxiety in university students: A protocol for a systematic review and meta-analysis. *Int. J. Educ. Res.* **2016**, *77*, 92–98. [CrossRef]
42. Stock, J.; Cervone, D. Proximal goal-setting and self-regulatory processes. *Cogn. Ther. Res.* **1990**, *14*, 483–498. [CrossRef]